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WO-A1-2009/128095
WO-A1-2014/013361
US-A- 4 493 427
US-A- 4 805 791

DESCRIPTION

[0001] The present invention relates to a plastic closure provided with a tamper-evident band; the closure being associable with a spout, typically applied to a flexible packaging, usually intended to contain drinks for children, such as juices and fruit purees, yoghurt, soft drinks, etc. The present invention also relates to an assembly comprising such a plastic closure and a spout.

[0002] As is known, most of the closures, especially if intended for food liquid containers, are provided with a tamper-evident seal, provided with weakened portions that, following the unscrewing of the closure from the spout, break, thus highlighting the fact that the container has already been opened.

[0003] For example, the Applicant is the owner of the patent family of the international application WO-A1-2008/050361. International publication WO-A1-2014/013361 discloses a closure with such a separable tamper-evident ring and suitable for a spout applied to a flexible packaging.

[0004] Sometimes, however, the user pays little attention to the actual conditions of the seal or the weakened portions are little evident and appear to be broken only after a thorough check.

[0005] The object of the present invention is to overcome the drawbacks mentioned with reference to the prior art by providing a closure for a spout provided with a tamper-evident seal for which the condition of breakage is particularly evident.

[0006] Such an object is achieved by a closure made according to independent claim 1 and by an assembly according to claim 8. The dependent claims describe alternative embodiments.

[0007] The features and the advantages of the closure according to the present invention will appear more clearly from the following description, made by way of an indicative and non-limiting example with reference to the following figures, in which:

- figure 1 shows a closure according to an embodiment of the present invention, applied to the spout of a flexible packaging, in an inviolate seal configuration;
 - figure 2 shows the closure in figure 1 in a violate seal configuration;
 - figure 3 shows the closure in figure 1 in separate parts;
 - figure 4 shows a side view of the closure in figure 1 (in an inviolate seal configuration);
 - figure 5 shows a sectional view of the closure in figure 1 (in an inviolate seal configuration); and
 - figure 6 shows an enlargement of detail VI in figure 5 (in an inviolate seal configuration);
 - figure 7 shows a side view of the closure in figure 2 (in a violate seal configuration);
 - figure 8 shows a sectional view of the closure in figure 2 (in a violate seal configuration);
- and

- figure 9 shows an enlargement of detail IX in figure 8 (in a violate seal configuration);
- figure 10 shows a closure according to a further embodiment of the present invention, applied to the spout of a flexible packaging, in an inviolate seal configuration;
- figure 11 shows the closure in figure 10 in a violate seal configuration;
- figure 12 shows the closure in figure 10 in separate parts;
- figure 13 shows a side view of the closure in figure 10 (in an inviolate seal configuration);
- figure 14 shows a sectional view of the closure in figure 10 (in an inviolate seal configuration); and
- figure 15 shows an enlargement of detail XV in figure 14 (in an inviolate seal configuration);
- figure 16 shows a side view of the closure in figure 11 (in a violate seal configuration);
- figure 17 shows a sectional view of the closure in figure 11 (in a violate seal configuration); and
- figure 18 shows an enlargement of detail XVIII in figure 17 (in a violate seal configuration);
- figure 19 shows a closure according to an even further embodiment of the present invention, applied to the spout of a flexible packaging, in an inviolate seal configuration;
- figure 20 shows the closure in figure 19 in a violate seal configuration;
- figure 21 shows a closure according to a further embodiment of the present invention, applied to the spout of a flexible packaging, in an inviolate seal configuration;
- figure 22 shows the closure in figure 21 in a violate seal configuration.

[0008] With reference to the accompanying figures, reference numeral 1 indicates as a whole a packaging for containing a substance, in particular for containing a food liquid.

[0009] Packaging 1 comprises a packaging body 2 preferably consisting of film walls.

[0010] For example, the packaging body 2 consists of a pair of facing side walls 2a, 2b, joined along a respective upper edge 4a, 4b, for example by welding.

[0011] According to an embodiment, the side walls 2a, 2b are joined together, for example by welding, along all the peripheral edges; in alternative embodiments, the packaging body instead comprises a bottom wall and/or one or two side walls, thus forming gusseted bags.

[0012] Packaging 1 further comprises a spout 6, applied to the packaging body 2, and a closure 8 applicable to spout 6 to close it.

[0013] Spout 6 comprises tubular body 10 that extends along a rectilinear main axis X, for example coincident with the central axis of the inner cylindrical side wall, between an entry end 12 and a dispensing end 14.

[0014] According to an embodiment, spout 6 comprises a connection portion 16, in

correspondence of the entry end 12 of the tubular body 10, for the sealed connection with the packaging body 2.

[0015] In particular, the connection portion 16 has connection faces 18a, 18b on opposite sides with respect to the main axis X, intended for the application of portions of the upper edges 4a, 4b of the side walls 2a, 2b.

[0016] From the entry end 12 towards the dispensing end 14, spout 6 also comprises a first plate 20, adjacent to the connection portion 16, and a second plate 22, axially spaced from the first plate 20, substantially parallel to the latter.

[0017] Said plates 20, 22 have a prevailing extension of imaginary planes substantially perpendicular to the main axis X.

[0018] Spout 6 further comprises a main abutment 24, for example made in the form of a ring, continuous or in separate sectors, axially spaced from the second plate 22.

[0019] Preferably, the main abutment 24 has a frusto-conical side surface 26, tapered towards the entry end of the tubular body 10, and is flanked by a main annular recess 28, undercut with respect to abutment 24.

[0020] Finally, spout 6 comprises a thread 30 external to the tubular body 10, for screwing closure 8.

[0021] According to the invention, closure 8 comprises a tamper-evident band 40.

[0022] According to a preferred embodiment (figures 1 to 9), the tamper-evident band 40 comprises a fixed annular band 42 directly engageable by the main abutment 24 of spout 6 so that the axial translation thereof is prevented.

[0023] For example, according to an embodiment variant, the fixed band 42 has a free end 44 bent radially internally or enlarged with respect to the remaining part, so that it is at least partially received in the main recess 28.

[0024] At the other end, the fixed band 42 has a flared wall 46 internally having an annular frusto-conical side surface 48 converging in the unscrewing direction of closure 8 from spout 6.

[0025] Closure 8 further comprises a movable body 50 which, during the unscrewing from spout 6, undergoes an axial translation that separates it from the spout itself.

[0026] When the tamper-evident band is inviolate, the movable body 50 is connected to the fixed band 42 through a weakened portion 52 of the tamper-evident band 40, in which an annular fixed edge 49 of the fixed band 42 and a movable edge 51 of the movable body 50 are joined.

[0027] For example, the tamper-evident band 40 comprises a cylindrical shank 54 of the movable body 50, joined to the fixed band 42 through the weakened portion 52; said weakened portion 52 is formed as a portion of reduced diameter by virtue of a radial notch 56 made externally.

[0028] Preferably, moreover, the movable body 50 comprises a handle 60 adapted to be grasped by a hand to perform the unscrewing of the closure, and an inner casing 62, from which said shank 54 projects axially, joined to handle 60 through a plurality of angularly spaced fins 64, between which passages 66 are formed between the inner casing 62 and handle 60, generally for anti-choking purpose.

[0029] The tamper-evident band 40 further comprises a tamper-evident ring 70 which, with the tamper-evident band inviolate, is housed in the compartment delimited by the fixed band 42 and is therefore hidden from view.

[0030] The tamper-evident ring 70 is made integral with the movable body 50 of closure 8, so that by unscrewing the latter, it undergoes an axial translation that makes it slip off from the spout.

[0031] Moreover, the tamper-evident ring 70 externally has a maximum diameter D_{max} greater than the minimum diameter D_{min} of the side surface 48 of the flared wall 46 of the fixed band 42, so that during the axial translation due to the unscrewing, it can pop out of the fixed band 42.

[0032] In particular, the tamper-evident ring 70 comprises a tamper-evident wall 72 having a frusto-conical outer surface 74, converging in the direction of translation of the movable body 50 during the unscrewing, for example parallel to the side surface 48 of the flared wall 46 of the fixed band 42.

[0033] According to an embodiment variant, closure 8 comprises a cap 80 having a bottom 82 and an annular cap wall 84, having an axial extension.

[0034] Bottom 82 preferably forms the closure for the mouth of the tubular body 10 of spout 6, while the end projection of the cap wall 84 forms said tamper-evident ring 70.

[0035] Moreover, the cap wall 84 internally has a thread for screwing with thread 30 of spout 6.

[0036] Cap 80 is made integral in translation and rotation to the movable body 50 of closure 8.

[0037] In particular, cap 80 is at least partially received in casing 62 of the movable body 50, so that the tamper-evident ring body 70 is still housed inside the compartment delimited by the fixed band 43.

[0038] In order to axially lock cap 80 to the movable body 50, said cap 80 is provided, for example on the outer surface of the cap wall 84, for example proximate to bottom 82, with a plurality of circumferential grooves 90, in which respective circumferential projections provided in casing 62 of the movable body 50 are snap-received.

[0039] In order to lock cap 80 in rotation to the movable body 50, said cap 80 is provided, for example on the outer surface of the cap wall 84, for example adjacent to the tamper-evident ring 70, with a plurality of axial grooves 92, in which respective axial projections provided in casing 62 of the movable body 50 are snap-received.

[0040] Cap 80 is made in a single piece, for example by injection moulding, of plastic material.

[0041] Likewise, the group consisting of the movable body 50 and the fixed band 42 is made in a single piece, for example by injection moulding, of plastic material.

[0042] Finally, the spout is made in a single piece, for example by injection moulding, of plastic material.

[0043] Once the movable body - fixed band 50, 42 group and cap 80 have been made, the cap is inserted into the inner casing 62 of the movable body 50, thus achieving the complete closure 8.

[0044] Once spout 6 has been sealably applied to packaging 2, the filling with the liquid is typically carried out through spout 6 and finally closure 8 is applied.

[0045] During the application, the closure is screwed to the tubular body 10 of spout 6 and during such screwing, the free ends 44 of the fixed band 52 snaps into the main recess 28, due to the flared profile of the side surface 26 of abutment 24.

[0046] At the first opening of packaging 1 (figures 2 and 7 to 9), the unscrewing of closure 8 makes the movable body 50 translate in the direction of extraction from the tubular body 10 of spout 6.

[0047] The fixed band 42 is urged to translate in the same direction, since it is initially integral with the movable body, but it is prevented from translating by the engagement between the free end 44 and the main abutment 24 of spout 6.

[0048] The weakened portion 52 thus undergoes a rupture, which makes the movable body 50 separate axially from the fixed band 42.

[0049] The axial translation of the movable body 50 drags in translation the tamper-evident ring 70 integral with said movable body 50, so that said ring 70, by cooperating with the flared wall 46 of the fixed band 42, snaps out of the compartment delimited by the fixed band 42, thus becoming visible from the outside.

[0050] In particular, the tamper-evident ring 70 first undergoes a deformation which makes it narrow and then, popped out of the fixed band, an elastic return to an undeformed condition.

[0051] For this reason, at the next screwing of the movable body to the spout, the tamper-evident ring 70 is prevented from returning into the fixed band, arranging itself in a clear manner between the fixed edge 49 and the movable edge 51, separate and axially spaced apart. The violation of the seal is thus evident.

[0052] Preferably, moreover, the colour of the tamper-evident ring 70, selected so as to stand out with respect to the colour of the fixed band 42 and the movable body 50, contributes to make the tamper-evident ring more evident.

[0053] In other words, according to the embodiment described above, the tamper-evident ring 70 is integral in translation with the movable body 50 of closure 8.

[0054] According to a further embodiment (figures 10 to 18), the tamper-evident band 40 instead comprises a tamper-evident bushing 100, in turn comprising a tamper-evident ring 170, which remains fixed to the spout during the translation of a movable body 50 of closure 8 during the unscrewing.

[0055] In particular, according to an embodiment variant, the tamper-evident bushing 100 comprises an annular base wall 102, which extends around the tubular body 10 of spout 6, and an annular engagement tooth 104, circumferentially continuous or divided into sectors, protruding radially internally from the base wall 102, so as to achieve a coupling with the main abutment 24 of spout 6; the axial translation of the tamper-evident bushing 100, in the unscrewing direction, is thus prevented or limited.

[0056] In particular, the engagement tooth 104 has a frusto-conical side surface 106 converging in the unscrewing translation direction of the movable body 50, so as to form a snap engagement with the main abutment 24, thus housing at least partially in the main recess 28.

[0057] The tamper-evident bushing 100 further comprises said tamper-evident ring 170, projecting axially and radially outwardly from the base wall 102.

[0058] According to an embodiment variant, the tamper-evident ring 170 comprises a tamper-evident wall 172 having a frusto-conical outer surface 174, diverging in the unscrewing translation direction of the movable body 50.

[0059] The movable body 50 of closure 8, which during the unscrewing from spout 6 undergoes an axial translation that makes it separate from the spout itself, comprises an annular shank 154, which extends around the tubular body 10 of spout 6.

[0060] The tamper-evident band 40 comprises a movable band 200 integral with the movable body 50, for example protruding axially from shank 154, and an annular fixed band 142, which extends around the tubular body 10 of spout 6.

[0061] When the tamper-evident band 40 is inviolate, the fixed band 142 and the movable band 200 are joined together through a weakened portion 152, in which an annular fixed edge 149 of the fixed band 142 and a movable edge 151 of the movable body 200 are joined.

[0062] For example, the weakened portion 152 is formed as a reduced diameter portion by virtue of an annular radial notch 156 externally formed between the movable band 100 and the fixed band 142.

[0063] The movable band 200 and the fixed band 142 are radially outwardly spaced from the tubular body 10 of spout 6, annularly delimiting a compartment in which the tamper-evident bushing 100 is housed.

[0064] In particular, the base wall 102 of bushing 100 is arranged radially between the fixed band 142 and the main abutment 24 of the tubular body 10, while the tamper-evident ring 170 is arranged radially between the movable band 200 and said tubular body 10.

[0065] Moreover, the tamper-evident ring 170 protrudes radially outwardly with respect to the weakened portion 152 that joins the movable band 200 and the fixed band 142, so as to form an obstacle which limits the axial translation in the unscrewing direction of said fixed band 142.

[0066] Moreover, the tamper-evident ring 170 is anchored to the tubular body 10 through the engagement tooth 104 engaged with the main abutment 24, whereby the fixed band 142 is indirectly constrained to the tubular body 10 and substantially prevented from the axial translation for unscrewing.

[0067] The movable band 200 internally has a frusto-conical side surface 248 diverging in the unscrewing direction of the movable body 50 from spout 6.

[0068] The tamper-evident ring 170 cooperates with the movable band 200 through said side surface 248, into contact with the outer surface 174 of the tamper-evident ring 170.

[0069] According to an embodiment variant, the fixed band 142 and the movable band 200 internally have a profile comprising:

- a frusto-conical guiding surface 144' of the fixed band 142, arranged at the mouth of the fixed band 142;
- preferably, a spacer surface 144" of the fixed band 142, preferably cylindrical, axially flanked inwardly to the guiding surface 144';
- said frusto-conical side surface 248 of the movable band 200, flanked to the spacer surface 144" (or, in an alternative embodiment, directly to the guiding surface 144').

[0070] According to an embodiment variant, the movable body 50 comprises a handle 160 adapted to be grasped by a hand to perform the unscrewing of the closure, and an inner casing 162, from which the movable band 200 projects axially, joined to handle 160 through a plurality of angularly spaced fins 164, between which passages 166 are formed between the inner casing 162 and handle 160, generally for anti-choking purpose.

[0071] Preferably, casing 162 is provided with a bottom 162', which forms the closure for the mouth of the tubular body 10 of spout 6, and an inner thread 162" for screwing to said tubular body 10.

[0072] The tamper-evident bushing 170 is made in a single piece, for example by injection moulding, of plastic material.

[0073] Likewise, the group consisting of the movable body 50, the movable band 200 and the fixed band 142 is made in a single piece, for example by injection moulding, of plastic material.

[0074] Finally, the spout is made in a single piece, for example by injection moulding, of plastic material.

[0075] Once the movable body - movable band - fixed band 50, 200, 142 group and the tamper-evident bushing 170 have been made, bushing 170 is inserted into the movable band 200 and the fixed band 142, thus achieving the complete closure 8.

[0076] To this end, the guiding surface 144' of the fixed band 142 allows the insertion of bushing 100 from the side of the tamper-evident ring 170, so that said ring 170 first shrinks, and then widens in the compartment defined by the movable band 200.

[0077] Once spout 6 has been sealably applied to packaging 2, the filling with the liquid is typically carried out through spout 6 and finally closure 8 is applied.

[0078] During the application, the closure is screwed to the tubular body 10 of spout 6 and during such screwing, the free ends 44 of the fixed band 52 snaps into the main recess 28, due to the flared profile of the side surface 26 of abutment 24.

[0079] At the first opening of packaging 1 (figures 11 and 16 to 18), the unscrewing of closure 8 makes the movable body 50 translate in the direction of extraction from the tubular body 10 of spout 6.

[0080] The fixed band 142 is urged to translate in the same direction, since it is initially integral with the movable body 50 through the weakened portion 142, but it is prevented from translating by the anchoring to the main abutment 24 through bushing 170.

[0081] The weakened portion 152 thus undergoes a rupture, which makes the movable body 50 separate axially from the fixed band 142.

[0082] The movable body 50 in translation drags the movable band 200 therewith, so that the tamper-evident ring 170, by cooperating with the side surface 248 of the movable band 200, snaps out of the movable band 200, thus becoming visible from the outside.

[0083] In particular, the tamper-evident ring 170 first undergoes a deformation which makes it shrink and then, popped out of the movable band, an elastic return to an undeformed condition.

[0084] For this reason, at the next screwing of the movable body to the spout, the tamper-evident ring 170 is prevented from returning into the movable band, arranging itself in a clear manner between the fixed edge 149 of the fixed band 142 and the movable edge 151 of the movable band 200, separate and axially spaced apart. The violation of the seal is thus evident.

[0085] Preferably, moreover, the colour of the tamper-evident ring 170, selected so as to stand out with respect to the colour of the fixed band 142 and the movable body 50, contributes to make the tamper-evident ring more evident.

[0086] According to further embodiments (figures 19 to 22), the movable body 50 consists of a casing 362, provided with a bottom 362' and a side wall 362'' projecting from bottom 362'.

[0087] According to an embodiment (figures 19 and 20), cap 80 is housed inside casing 362 and the tamper-evident band is provided with the structural and functional features described for the embodiment according to figures 1 to 9.

[0088] According to a further embodiment (figures 21 and 22), bottom 362' of casing 362 closes the mouth of the tubular body 10 of spout 6, the end portion of the side wall 362'' constitutes the movable band 200 and the tamper-evident band is provided with the structural and functional features described for the embodiment according to figures 10 to 18.

[0089] Innovatively, the closure with tamper-evident band according to the present invention overcomes the drawbacks mentioned with reference to the prior art, since the violation of the band is very evident.

[0090] In fact, the tamper-evident ring, especially if selected so as to have a colour contrasting with the other components of the closure, is immediately evident.

[0091] It is clear that a man skilled in the art may make changes to the closure described above in order to meet incidental needs, all falling within the scope of protection defined in the following claims.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO2008050361A1 [0003]
- WO2014013361A1 [0003]

Patentkrav

1. Lukning (8) omfattende et anbrudssikret bånd (40), beregnet til indpakning (1) til indeholdelse af væsker, i særdeleshed drikkevarer til børn, såsom juicer og frugtpure, yoghurt, læskedrikke og lignende, hvor nævnte lukning er anvendelig
 5 på en tud (6) forsynet med et rørformet legeme (10) forsynet med et ringformet hovedanslag (24) og yderligere omfattende:

- et fastsiddende bånd (42,142) indgribeligt direkte eller indirekte af nævnte hovedanslag (24) for at begrænse den aksiale translation i afskruningsretningen af lukningen;
- 10 - et bevægeligt legeme (50) omfattende et hylster (62,162) skruebart til det rørformede legeme (10) af tuden (6), hvor nævnte fastsiddende bånd (42,142), med det anbrudssikrede bånd (40) ubrudt, er forbundet til det bevægelige legeme (50) igennem en svækket del (52,152) der forbinder en fastsiddende kant (49,149) af det fastsiddende bånd (42,142) og en
 15 bevægelig kant (51,151) af det bevægelige legeme (50);
- en anbrudssikret ring (70,170) der slutter med en ringformet anbrudssikret kant (71,171), huset, med det anbrudssikrede bånd (40) ubrudt, i et indre rum af lukningen (8) som ikke er synligt; hvor den svækkede del (52,152) er egnet til at blive revet itu på grund af
 20 afskruningen af lukningen (8) fra tuden (6) og den anbrudssikrede ring (70,170) stikker ud af nævnte indre rum og er tilgængelig, med det anbrudssikrede bånd (40) brudt, for således at separere den fastsiddende kant (49,149) af det fastsiddende bånd (42,142) og den bevægelige kant (51,151) af det bevægelige legeme (50).

25

2. Lukning ifølge krav 1, snapanvendelig til tuden (6).

3. Lukning ifølge krav 2, hvor det fastsiddende bånd (42) har en fri ende (44) bøjet radialt indad eller forstørret i forhold til den resterende del, således at den
 30 er mindst delvist snapmodtaget i en hovedreces (28) dannet i underskæring af nævnte hovedanslag (24).

4. Lukning ifølge et hvilket som helst af de foregående krav, hvor den anbrudssikrede ring (70) er integreret med det bevægelige legeme (50), er modtaget, med tætningen ubrudt, i et rum afgrænset af det fastsiddende bånd (42), og stikker ud af nævnte rum på grund af afskrningen af lukningen (8).

5

5. Lukning ifølge krav 1 eller 2, hvor den anbrudssikrede ring (170) kan forankres til nævnte hovedvederlag (24) af tuden (6), for derved at forhindre translation på grund af afskrningen af lukningen (8).

10 **6.** Lukning ifølge krav 5, hvor det bevægelige legeme (50) omfatter et bevægeligt bånd (200) forbundet, med tætningen ubrudt, til det fastsiddende bånd (142) igennem den svækkede del (152), den anbrudssikrede ring (170) er modtaget i et rum afgrænset af nævnte bevægelig bånd (200) og stikker ud fra nævnte rum på grund af afskrningen af lukningen (8).

15

7. Lukning ifølge krav 5 eller 6, hvor det fastsiddende bånd (142) begrænses i aksial translation ved hjælp af en anbrudssikret bøsning (100) af hvilken nævnte anbrudssikrede ring (170) er en del, hvor nævnte anbrudssikrede bøsning (100) er snapindgribelig med nævnte hovedanslag (24) af tuden (6).

20

8. Anordning omfattende:

- en tud (6) anvendelig til et indpakningslegeme (2) med filmvægge, omfattende:

25 i) et rørformet legeme (10) der strækker sig langs en hovedakse (X) retlinjet mellem en indgangsende (12) og en dispenseringsende (14);

ii) en forbindelsesdel (16), i korrespondance af indgangsenden (12) af det rørformede legeme (10), til den tætnede forbindelse med indpakningslegemet (2);

30 iii) et ringformet hovedvederlag (24) der fremspringer radialt udad fra det rørformede legeme (10);

- en lukning (8) med anbrudssikret bånd (40), anvendt på tuden (6), omfattende:

- i) et fastsiddende ringformet bånd (42), snapindgrebet med hovedanslaget (24) af tuden (6);
- 5 ii) et bevægeligt legeme (50) skruebart til det rørformede legeme (10) af tuden (6), hvor nævnte fastsiddende bånd (42,142), med det anbrudssikrede bånd ubrudt, er forbundet til det bevægelige legeme (50) igennem en svækket del (52,152) der forbinder en fastsiddende kant (49,149) af det fastsiddende bånd (42,142) og en
10 bevægelig kant (51,151) af det bevægelige legeme (50) ;
- iii) en anbrudssikret ring (70) integreret i det bevægelige legeme (50), der slutter med en ringformet anbrudssikret kant (50), huset, med det anbrudssikrede bånd ubrudt, i et indre rum afgrænset af det fastsiddende bånd (42) som ikke er synligt;
- 15 hvor den svækkede del (52) er egnet til at blive revet itu på grund af afskrningen af lukningen (8) fra tuden (6) og den anbrudssikrede ring (70) stikker ud af nævnte indre rum og er tilgængelig, med tætningen brudt, for således at separere den fastsiddende kant (49) af det fastsiddende bånd (42) og den
20 bevægelige kant (51) af det bevægelige legeme (50).

DRAWINGS

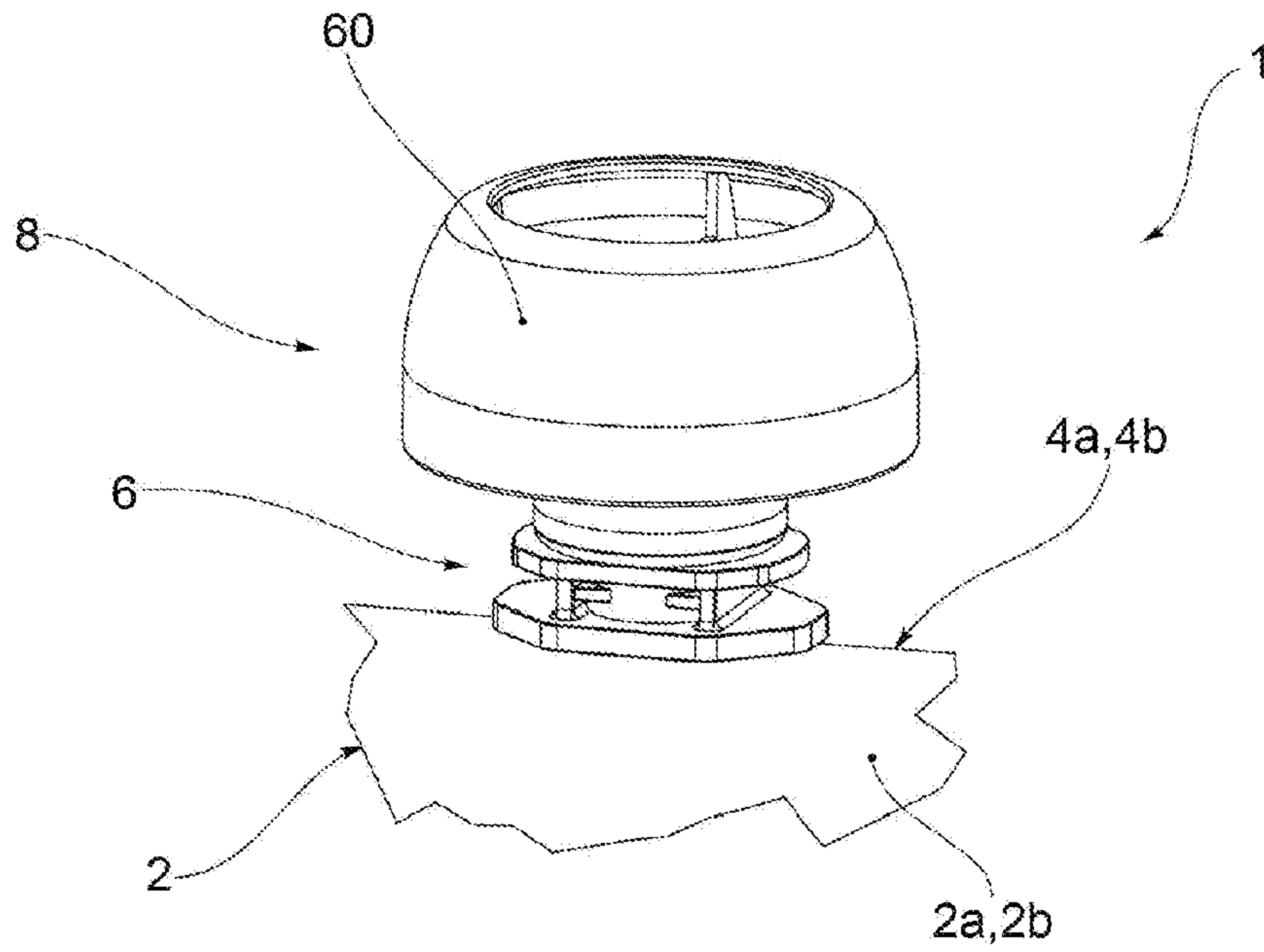


FIG.1

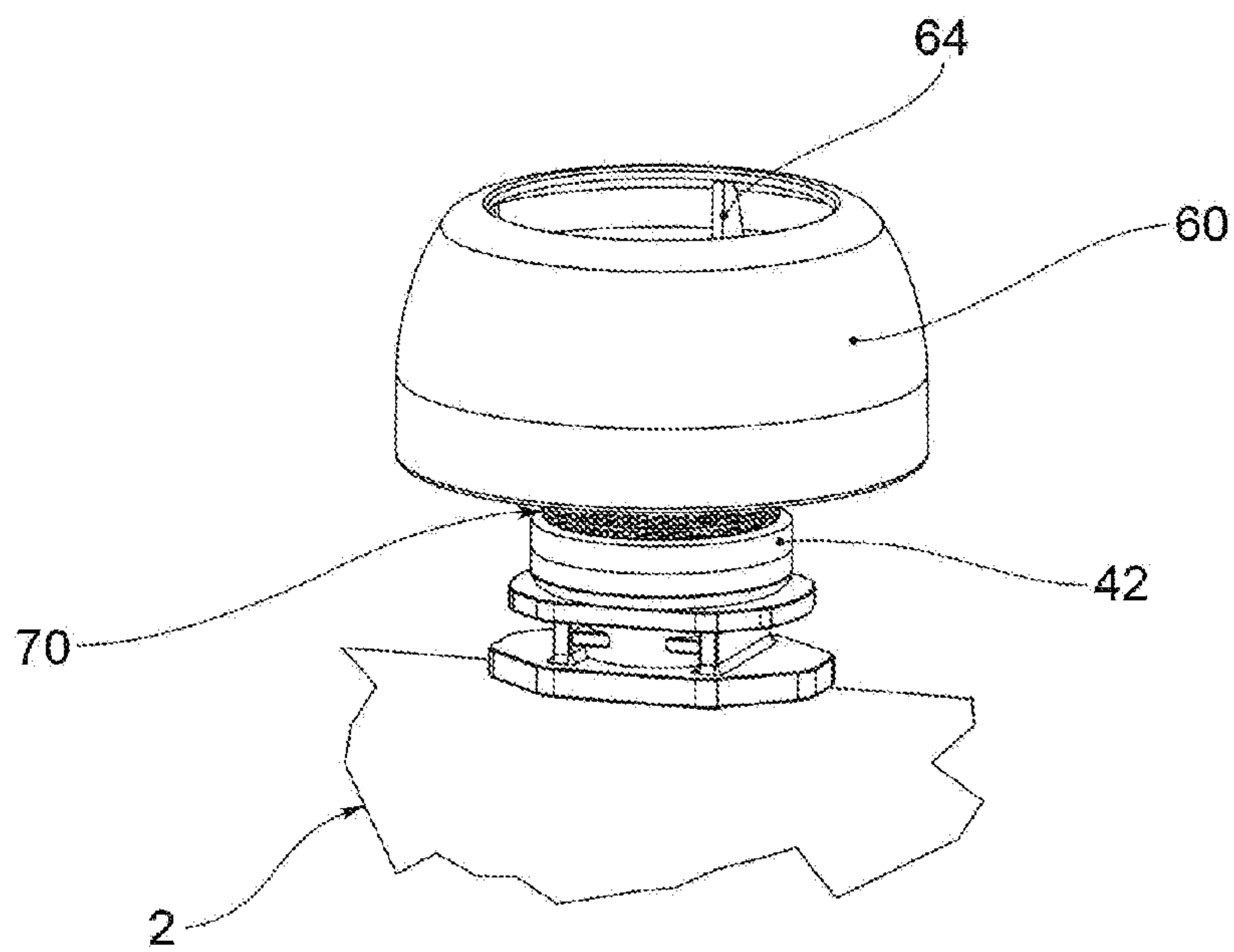


FIG.2

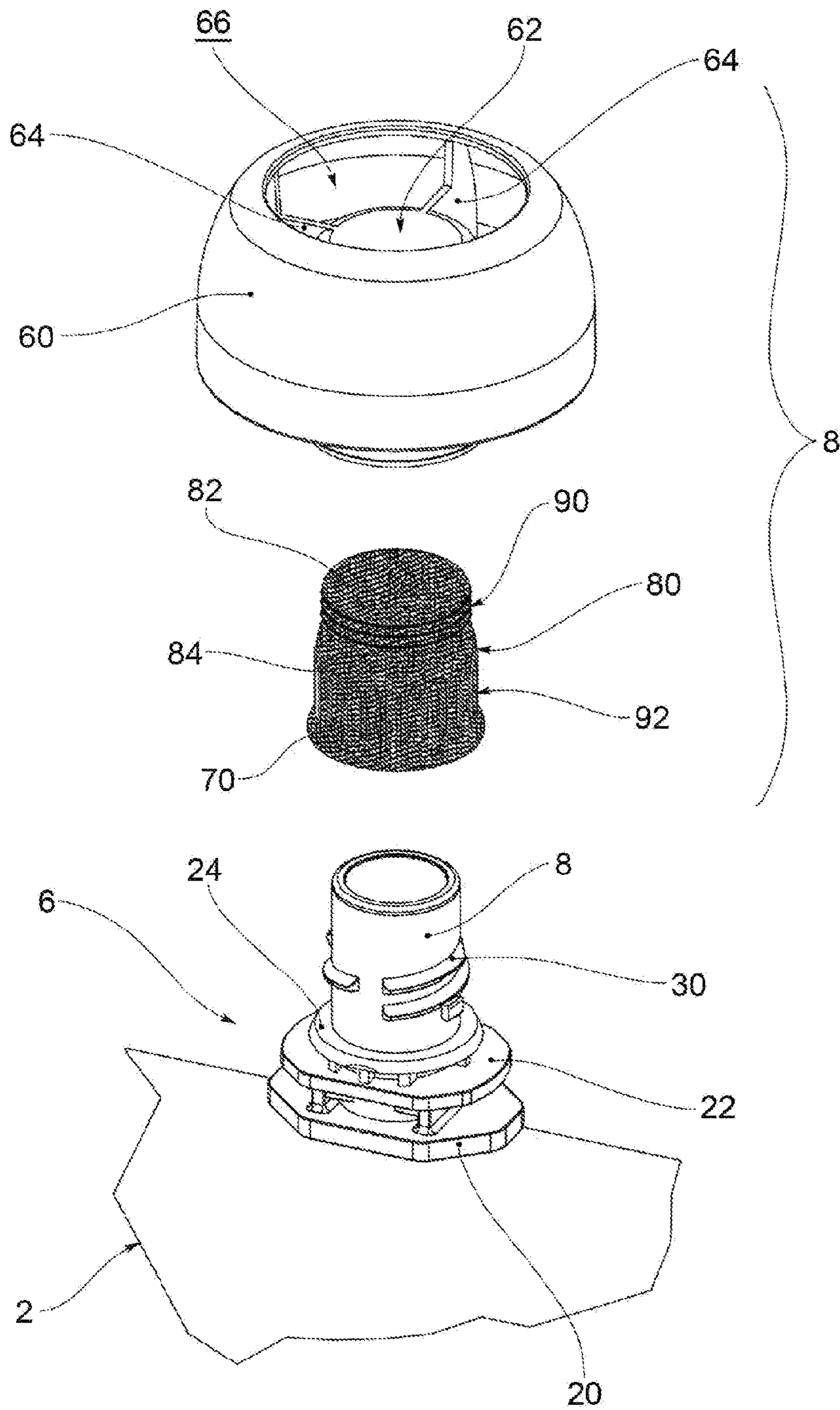


FIG.3

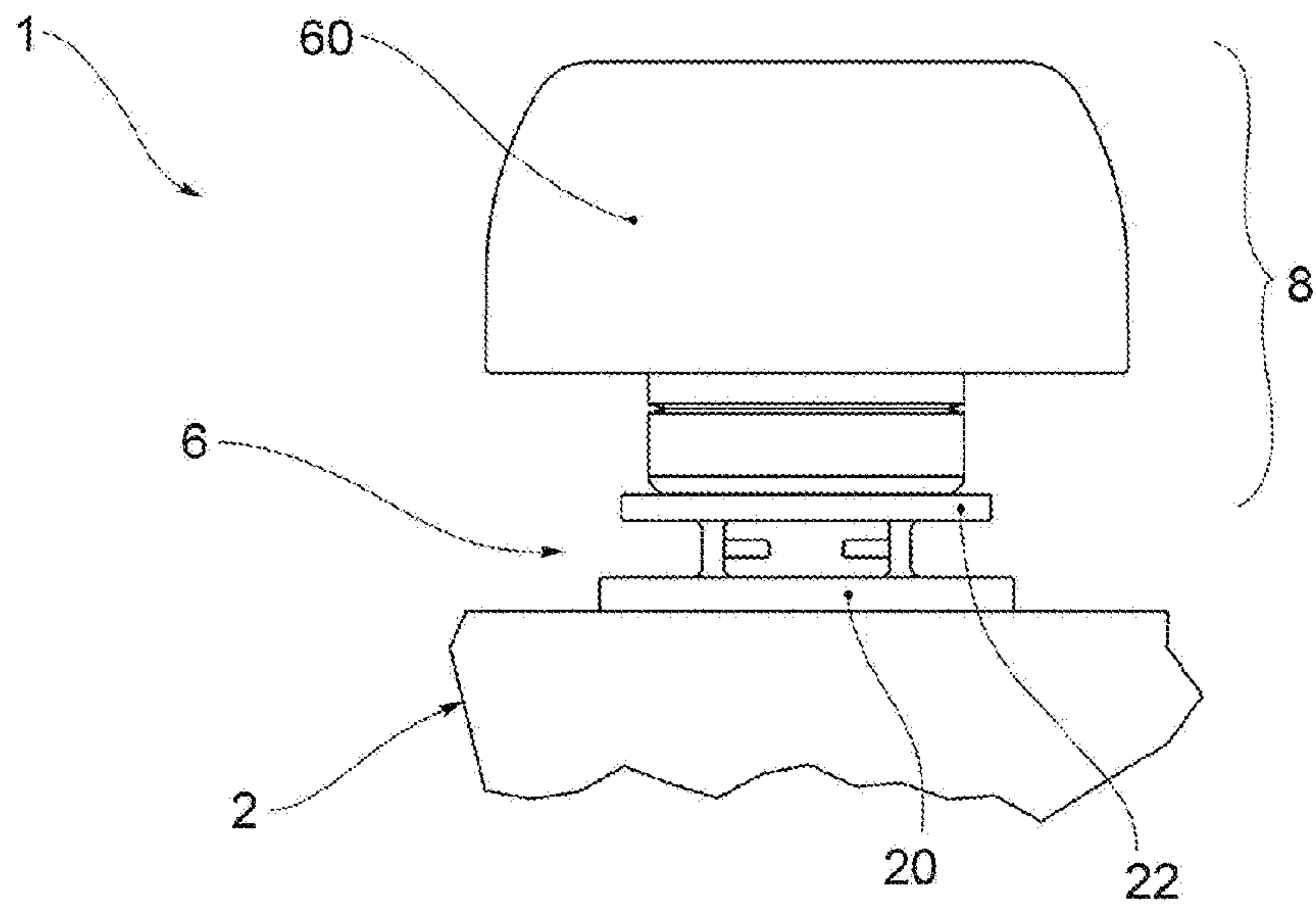


FIG. 4

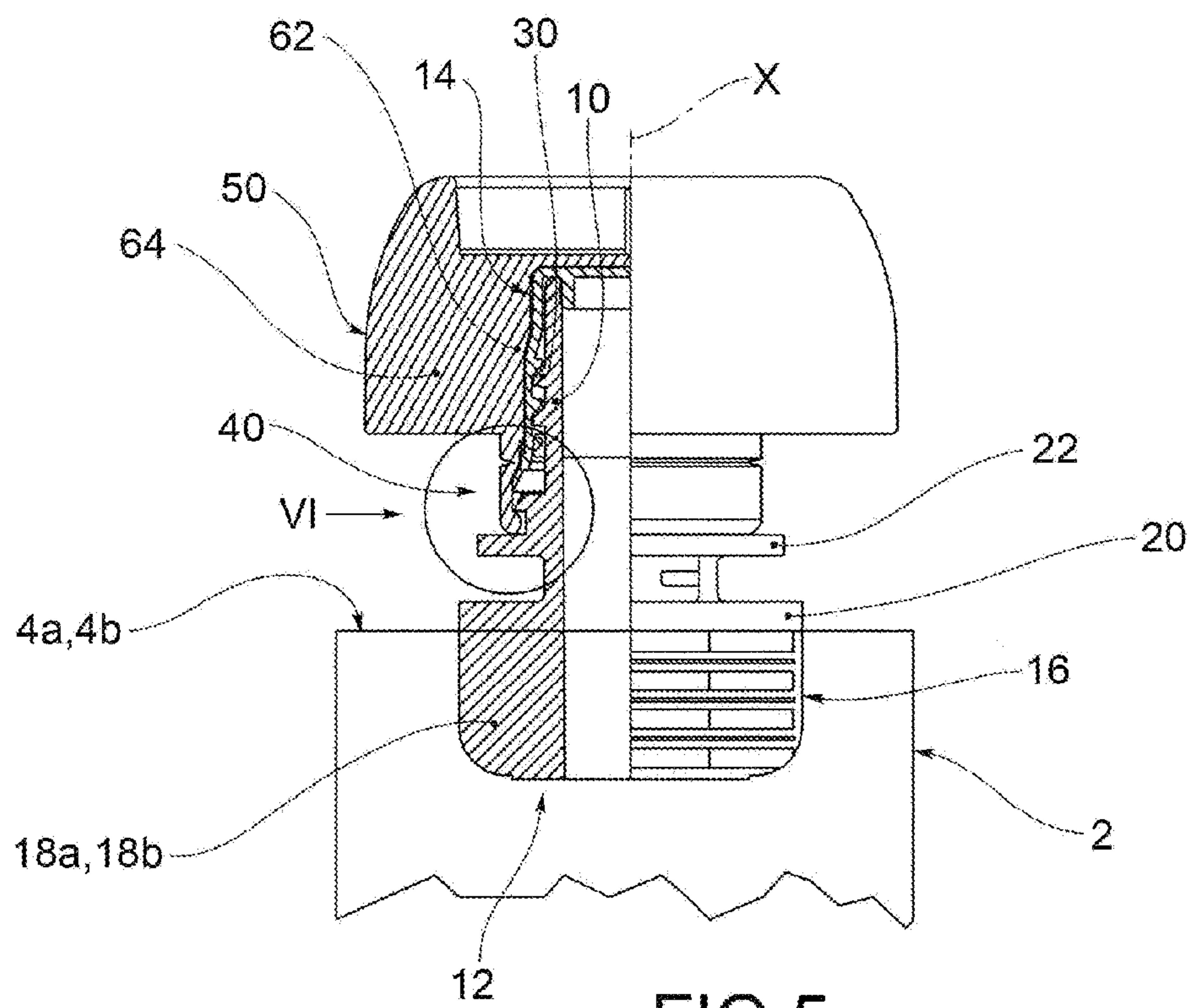


FIG. 5

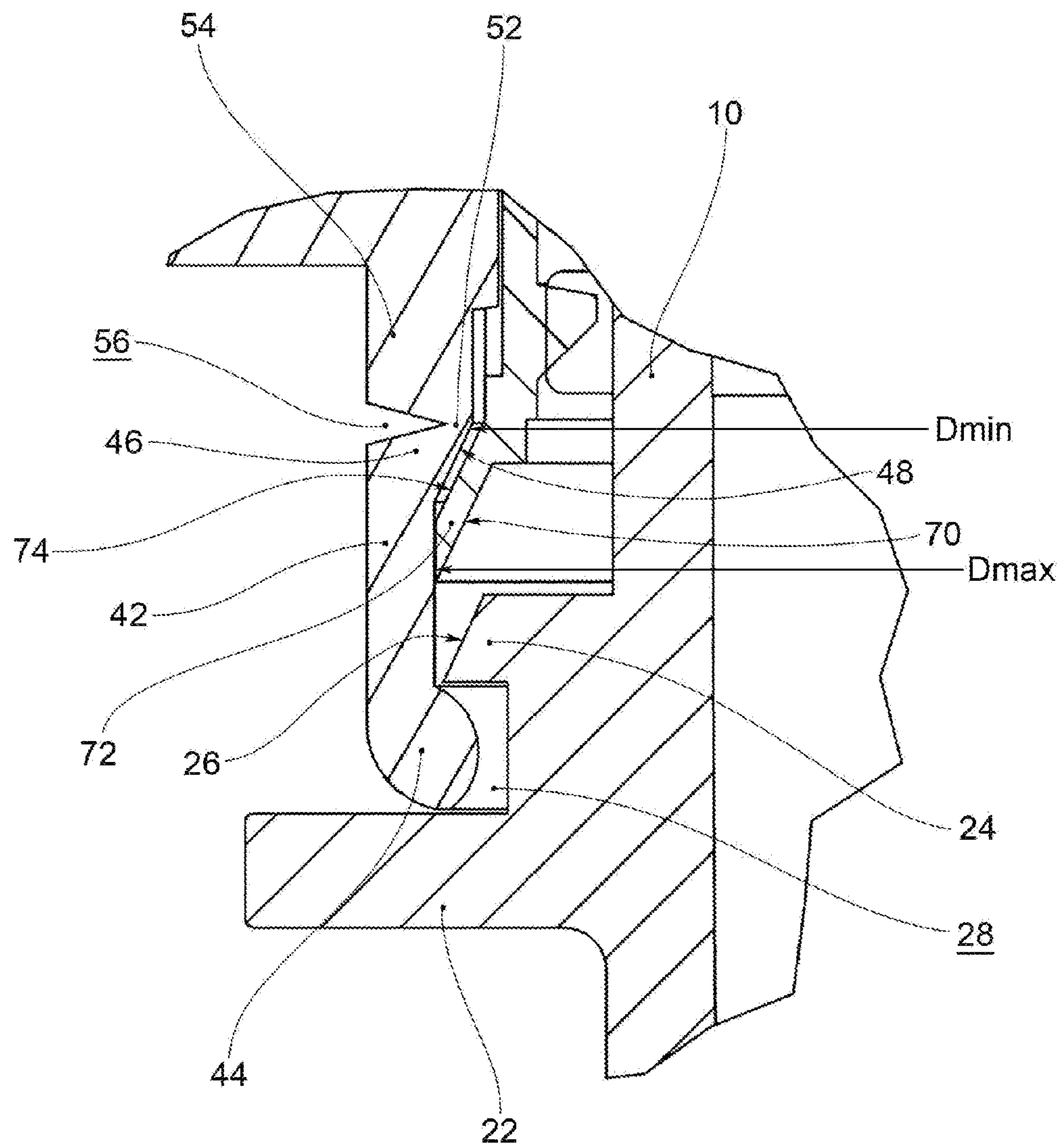


FIG.6

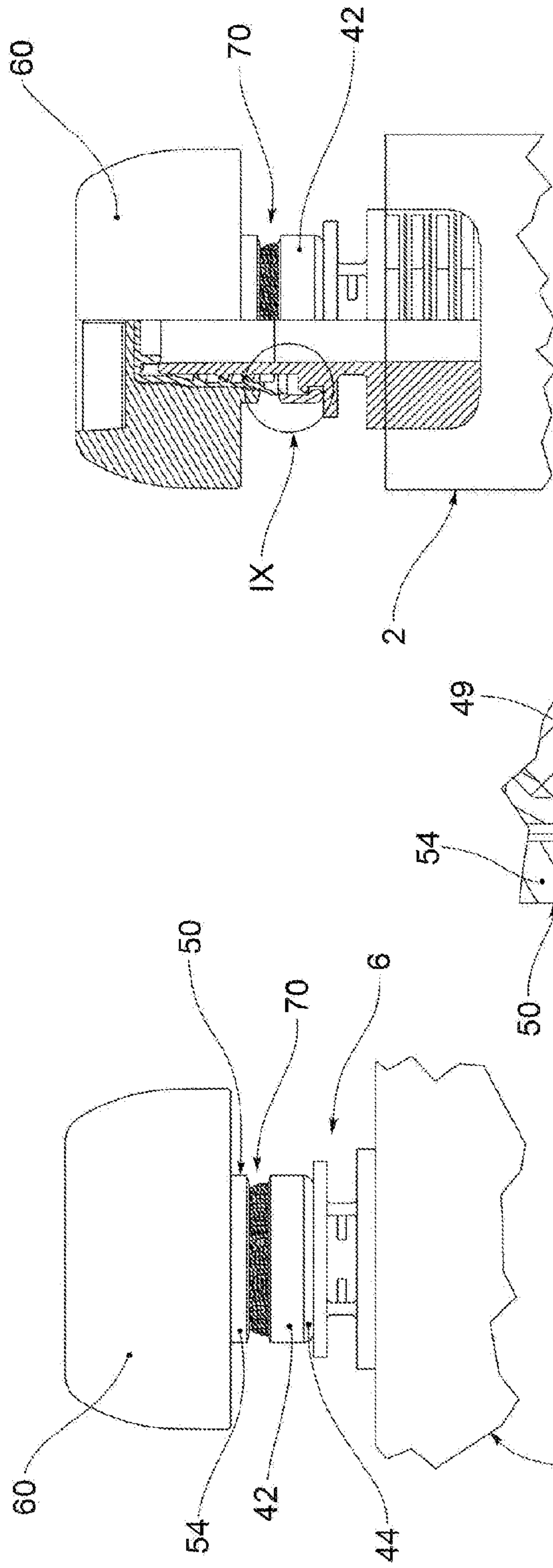


FIG. 7

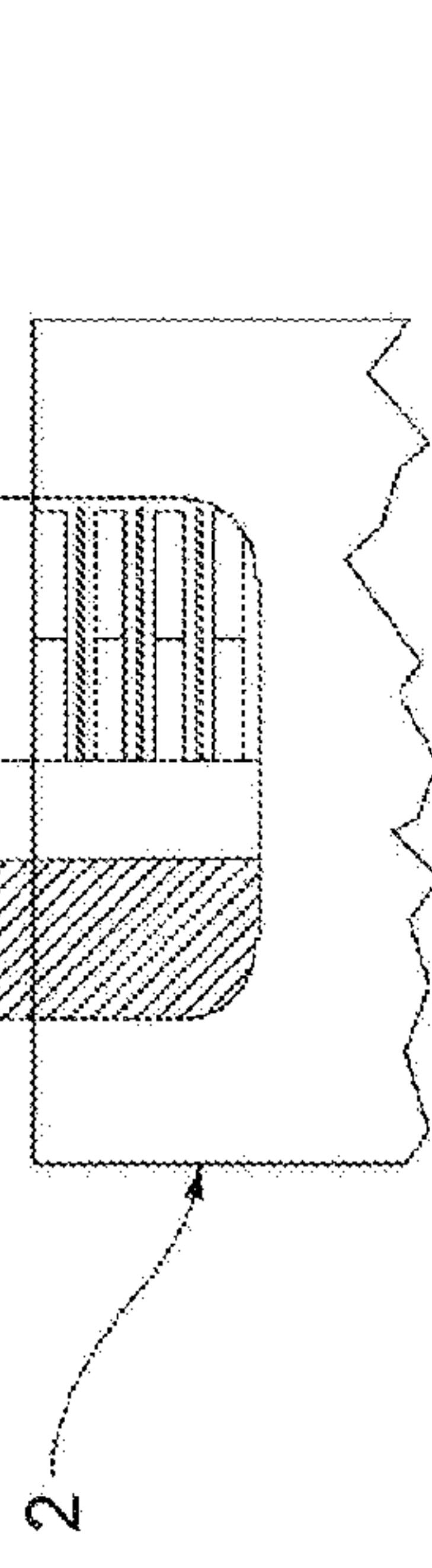


FIG. 8

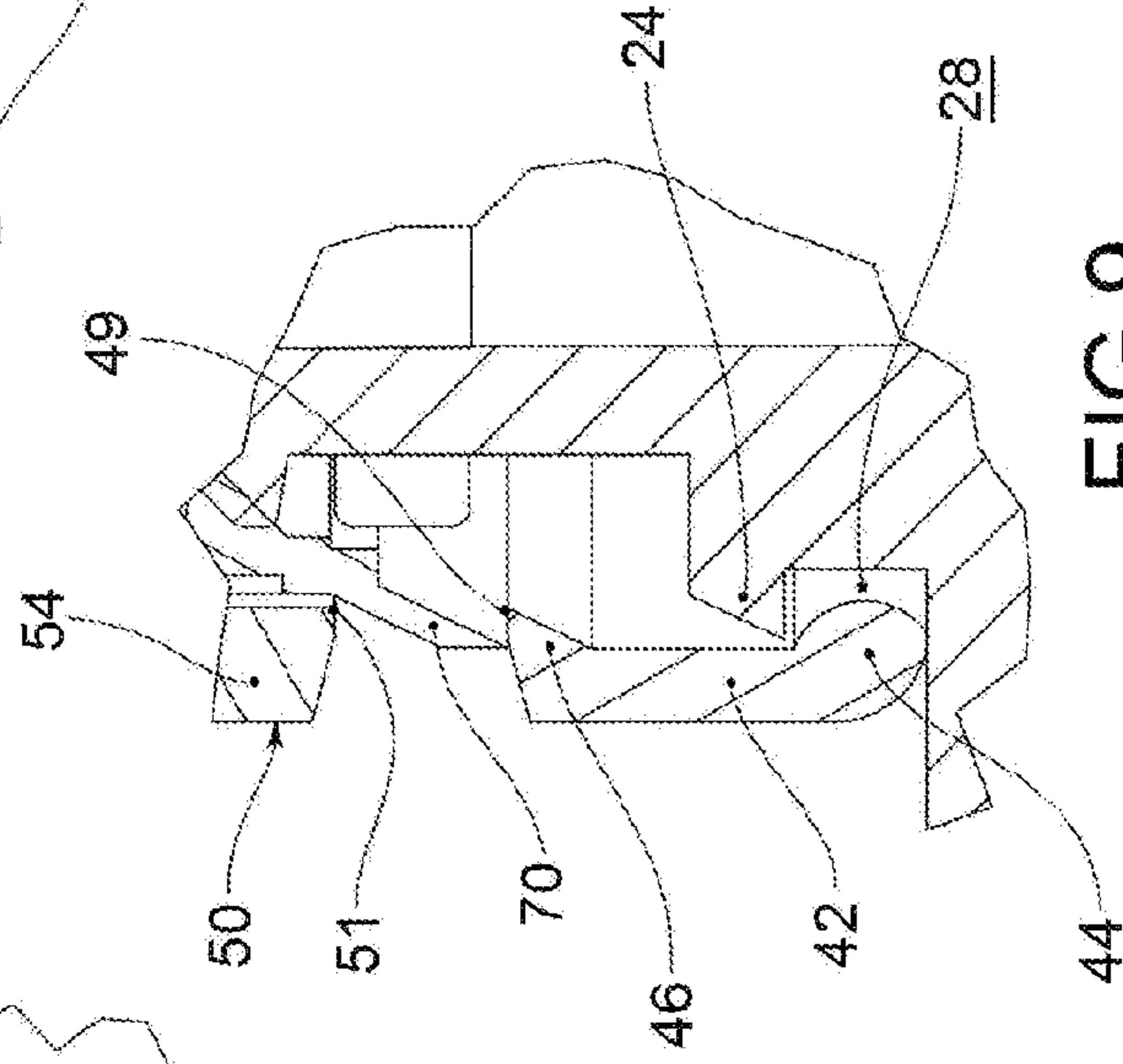


FIG. 9

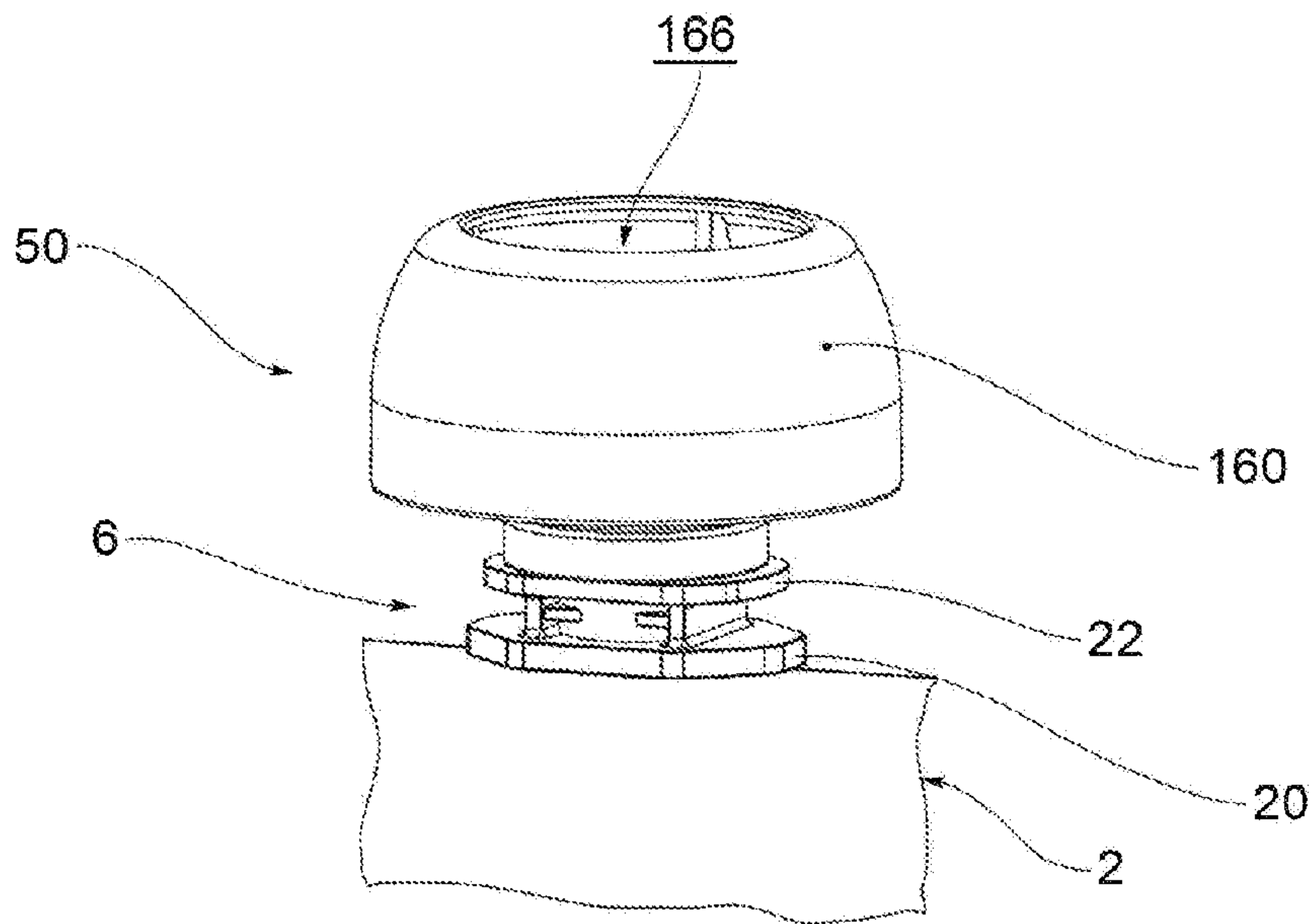


FIG.10

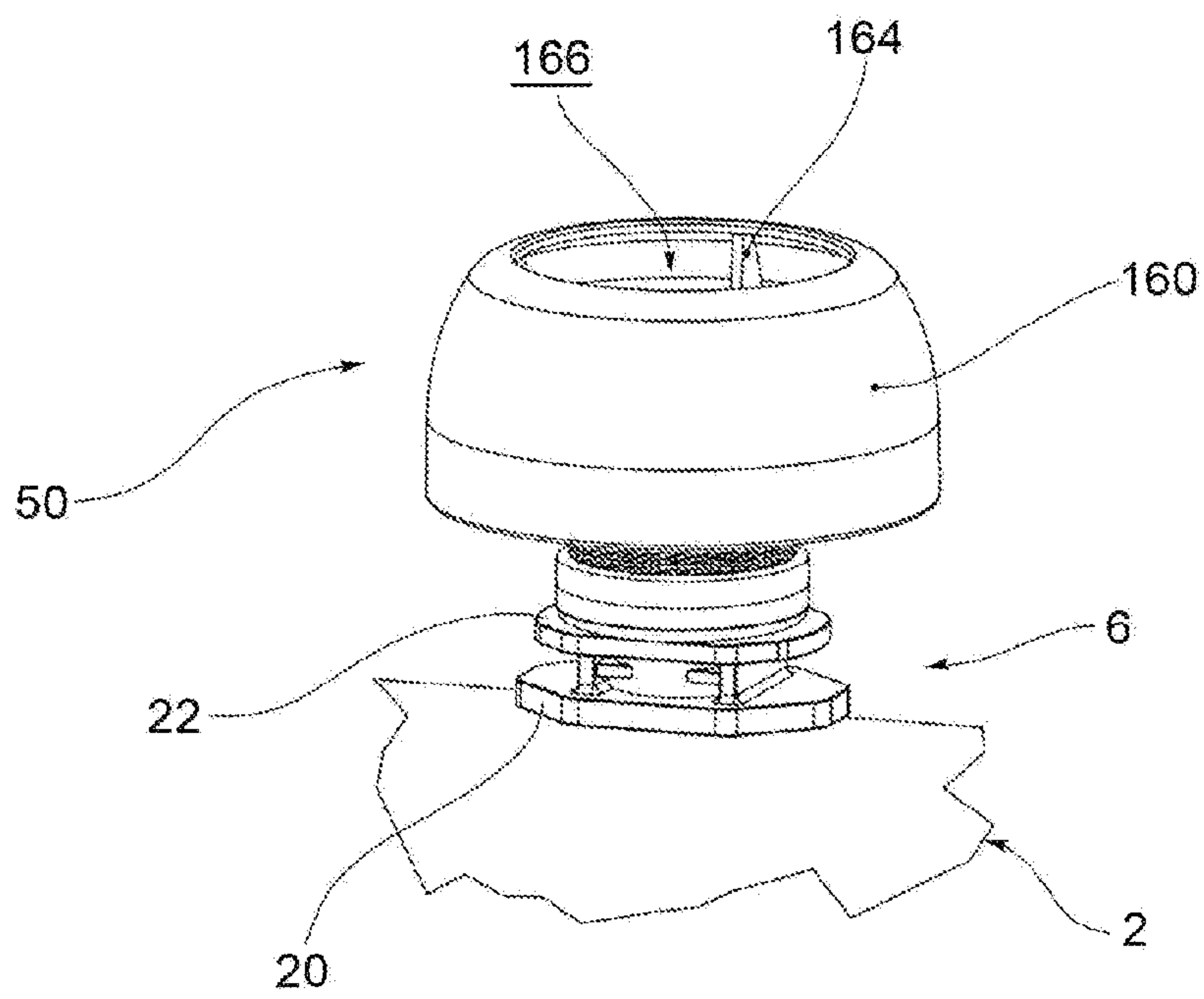


FIG.11

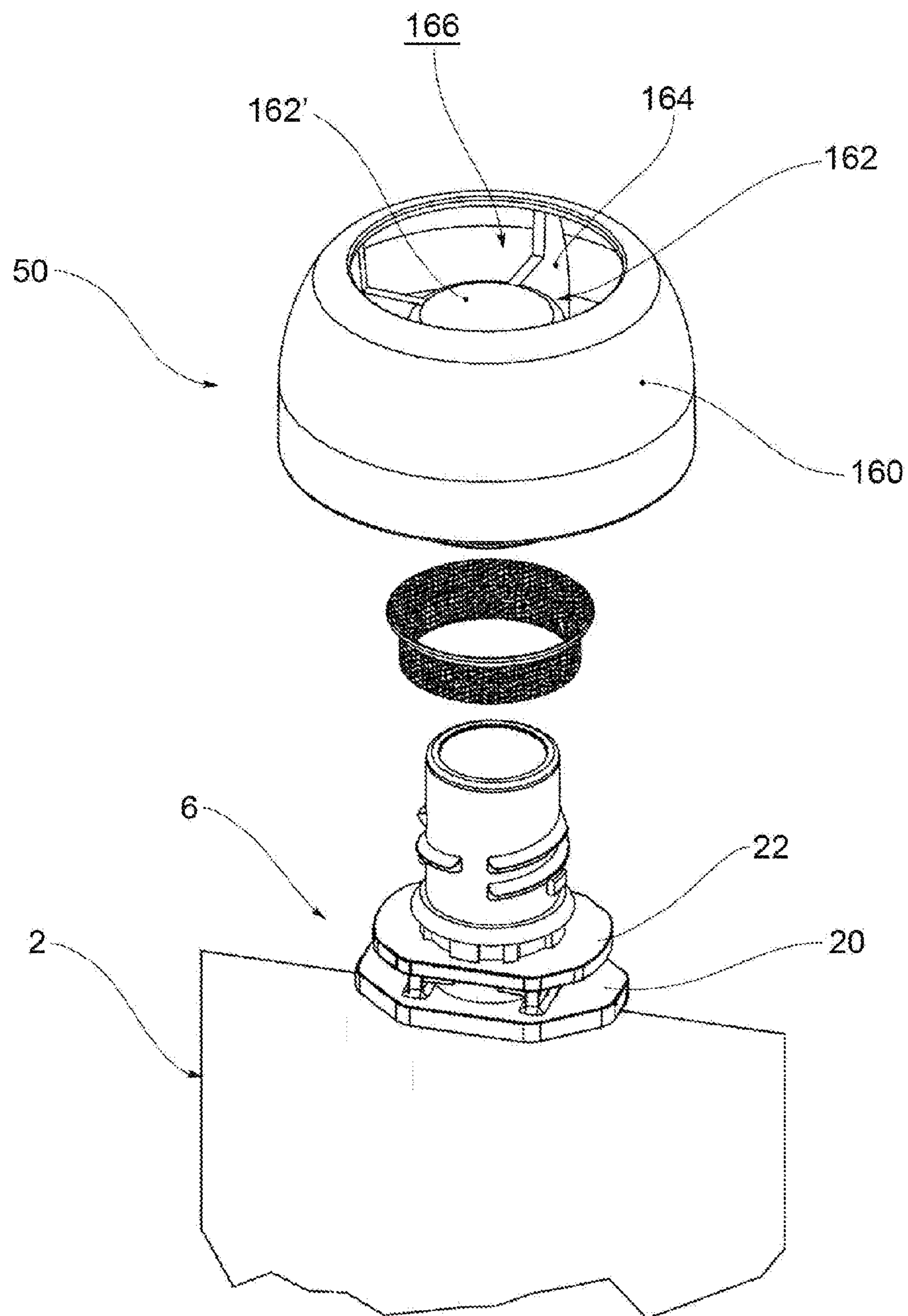


FIG.12

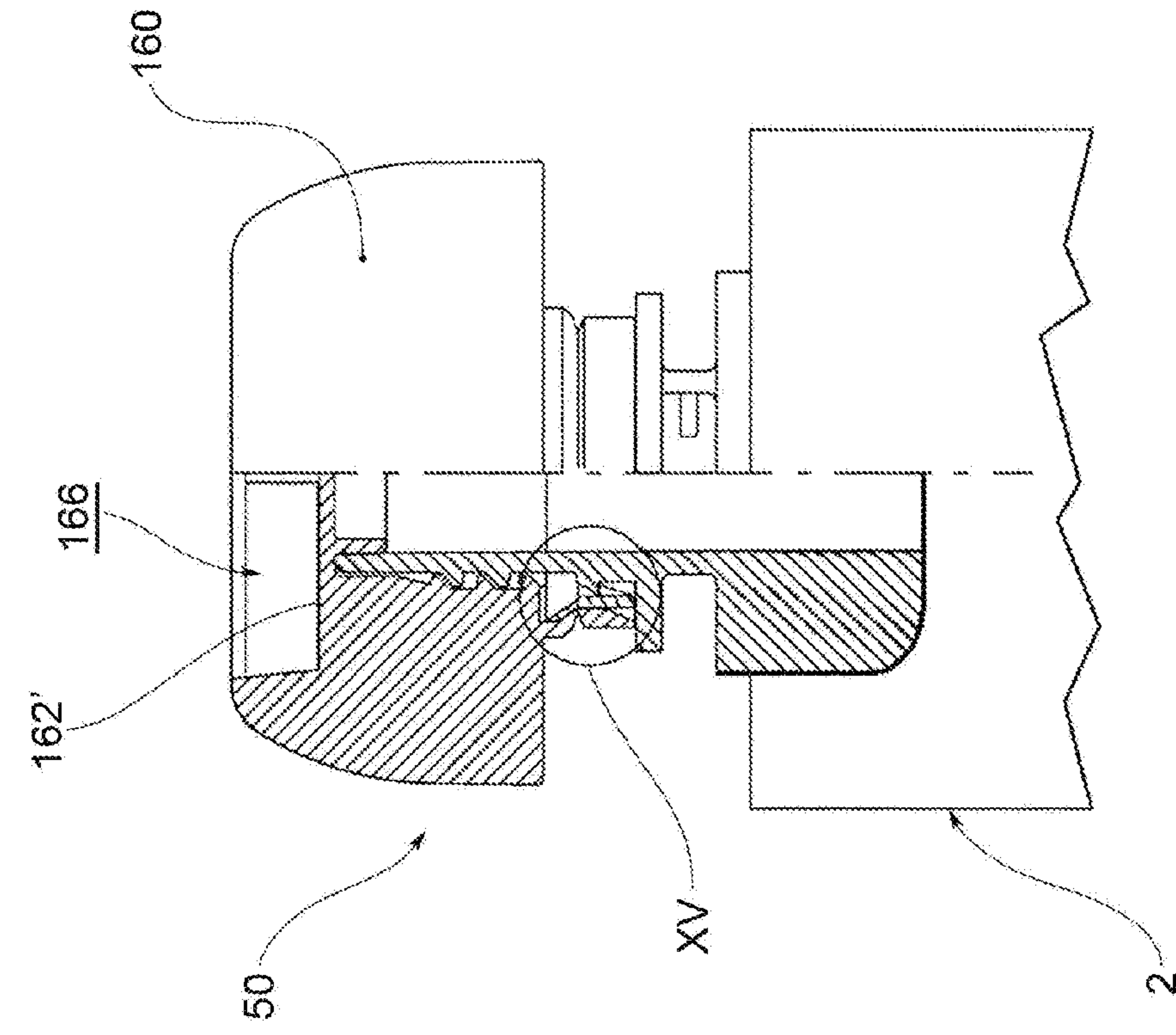


FIG.14

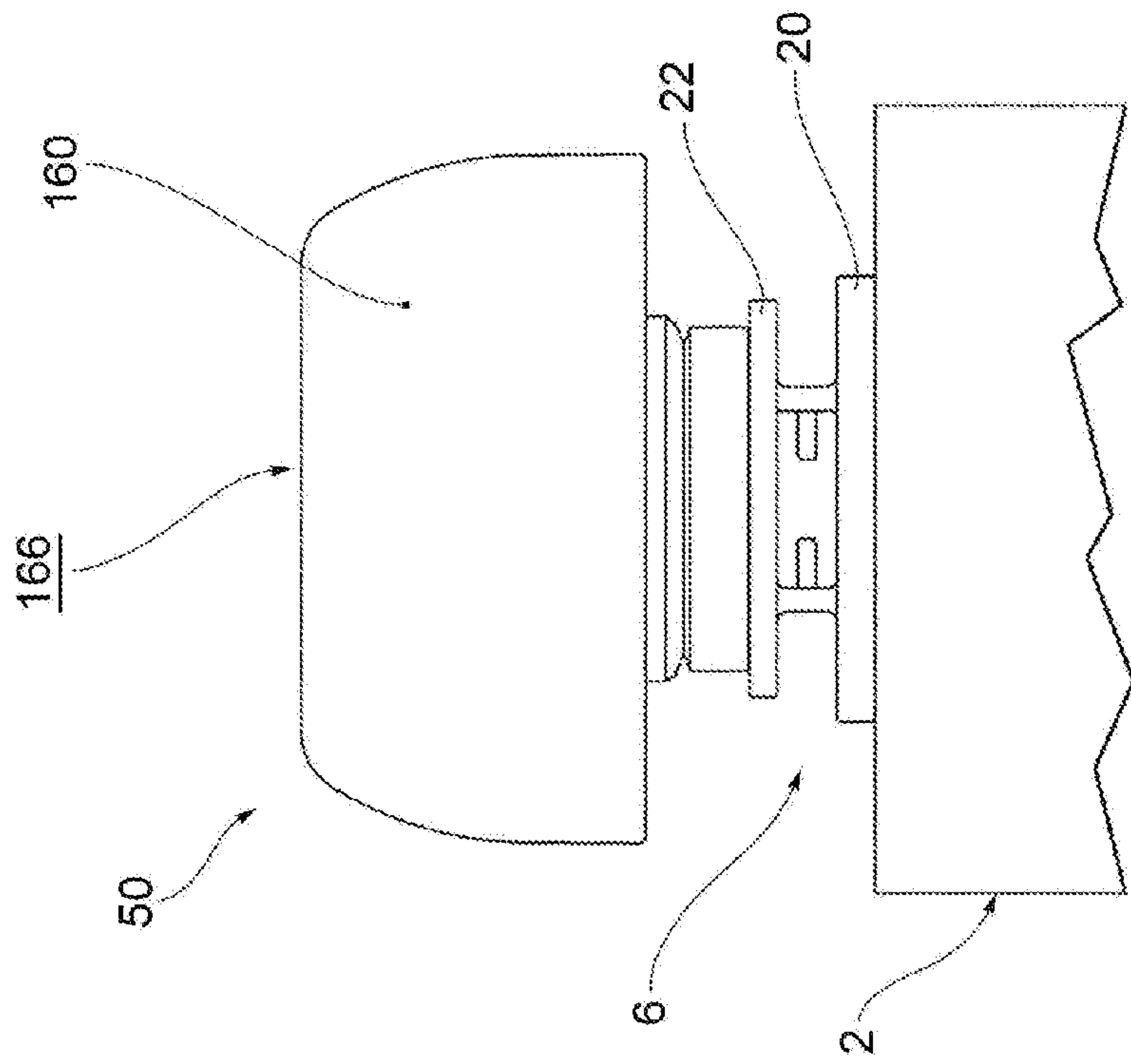


FIG.13

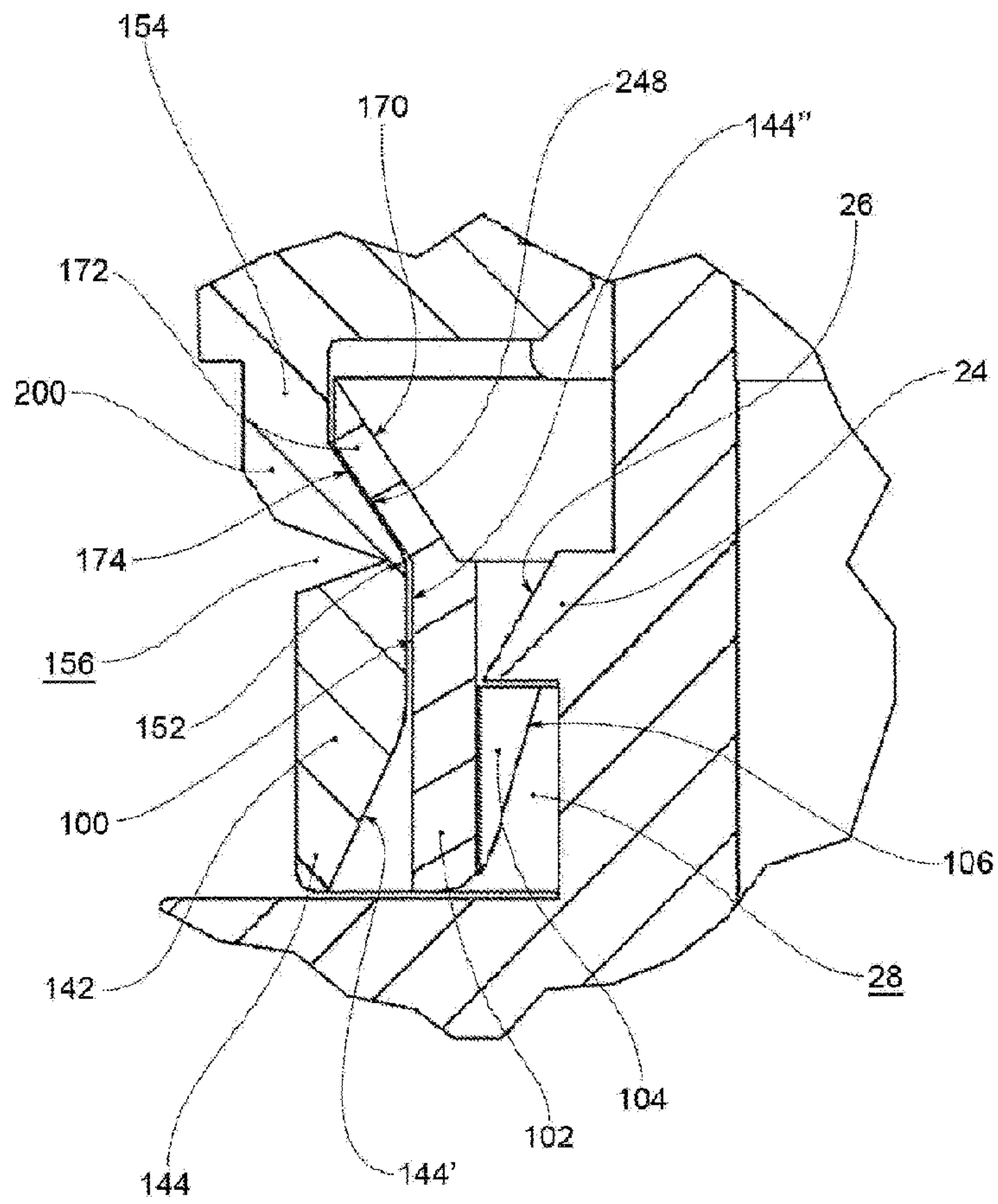


FIG.15

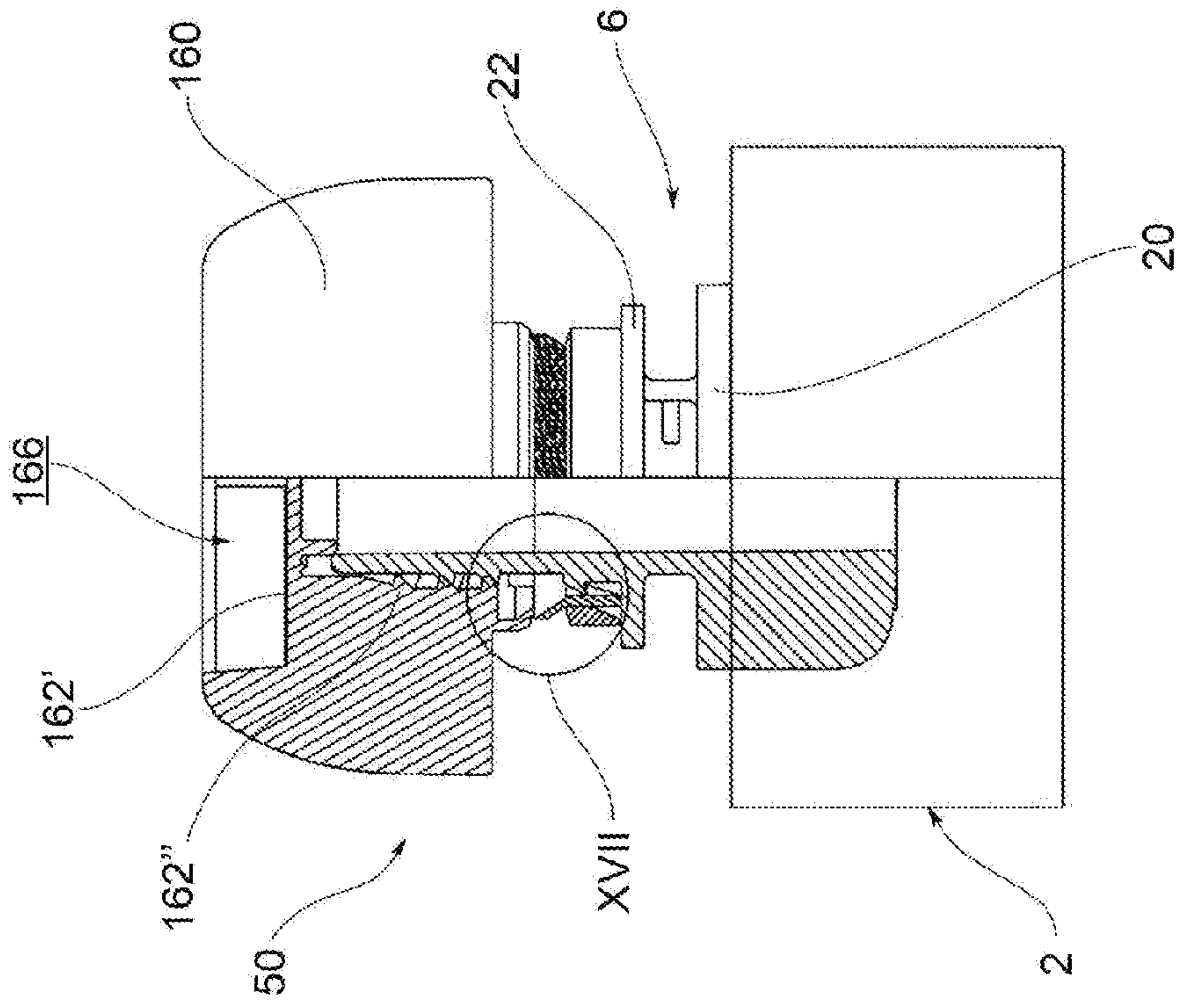


FIG.16

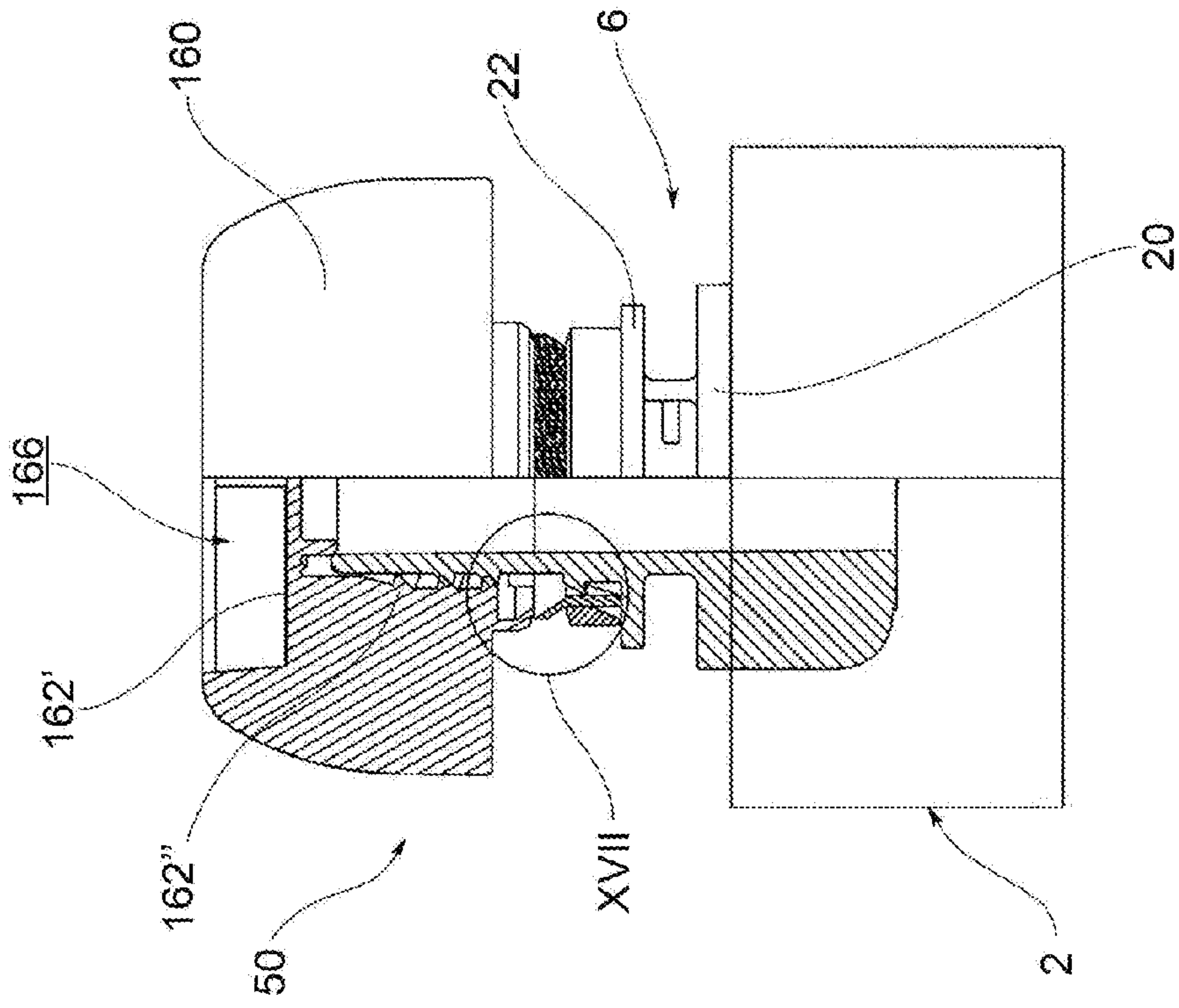


FIG.17

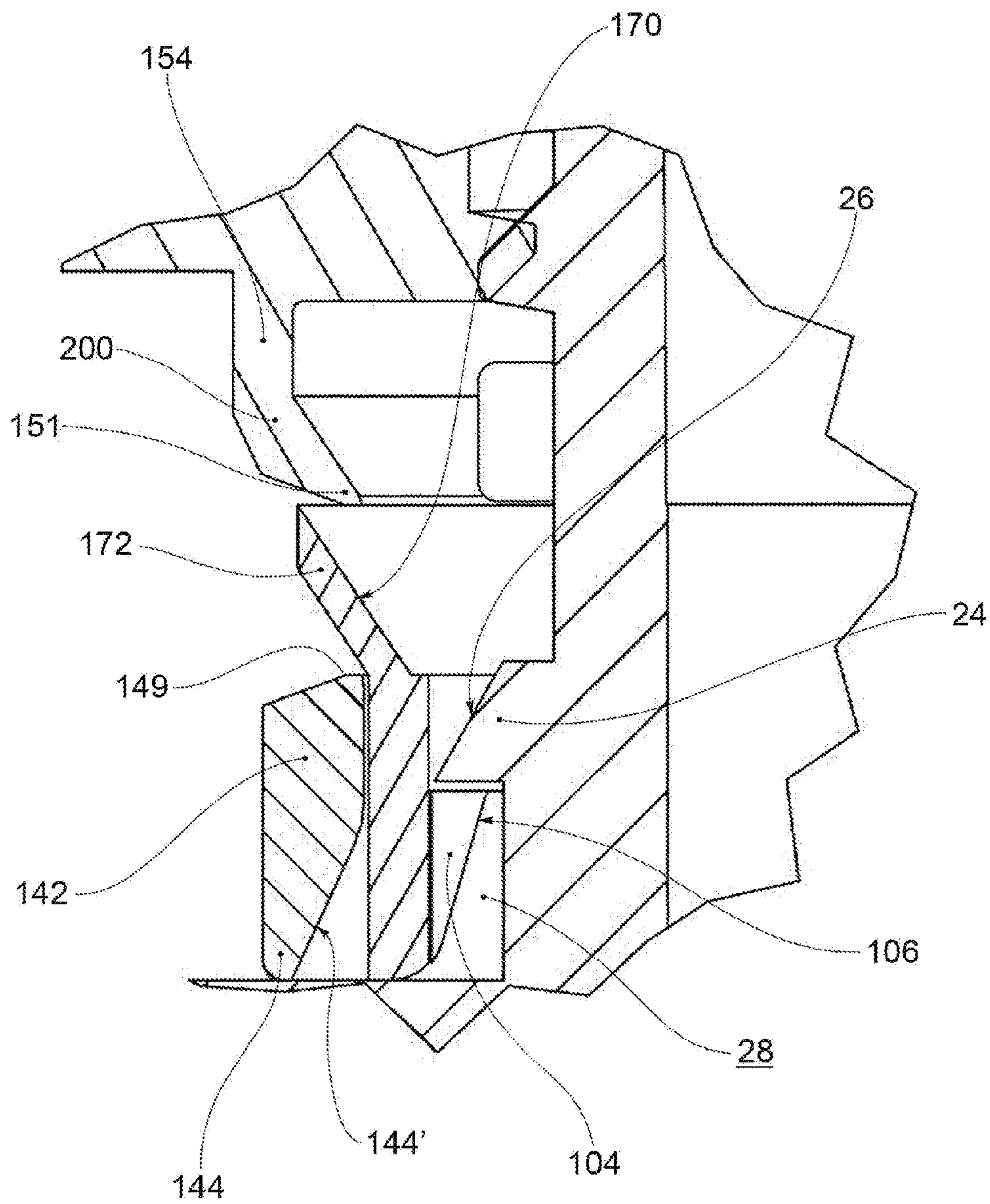


FIG.18

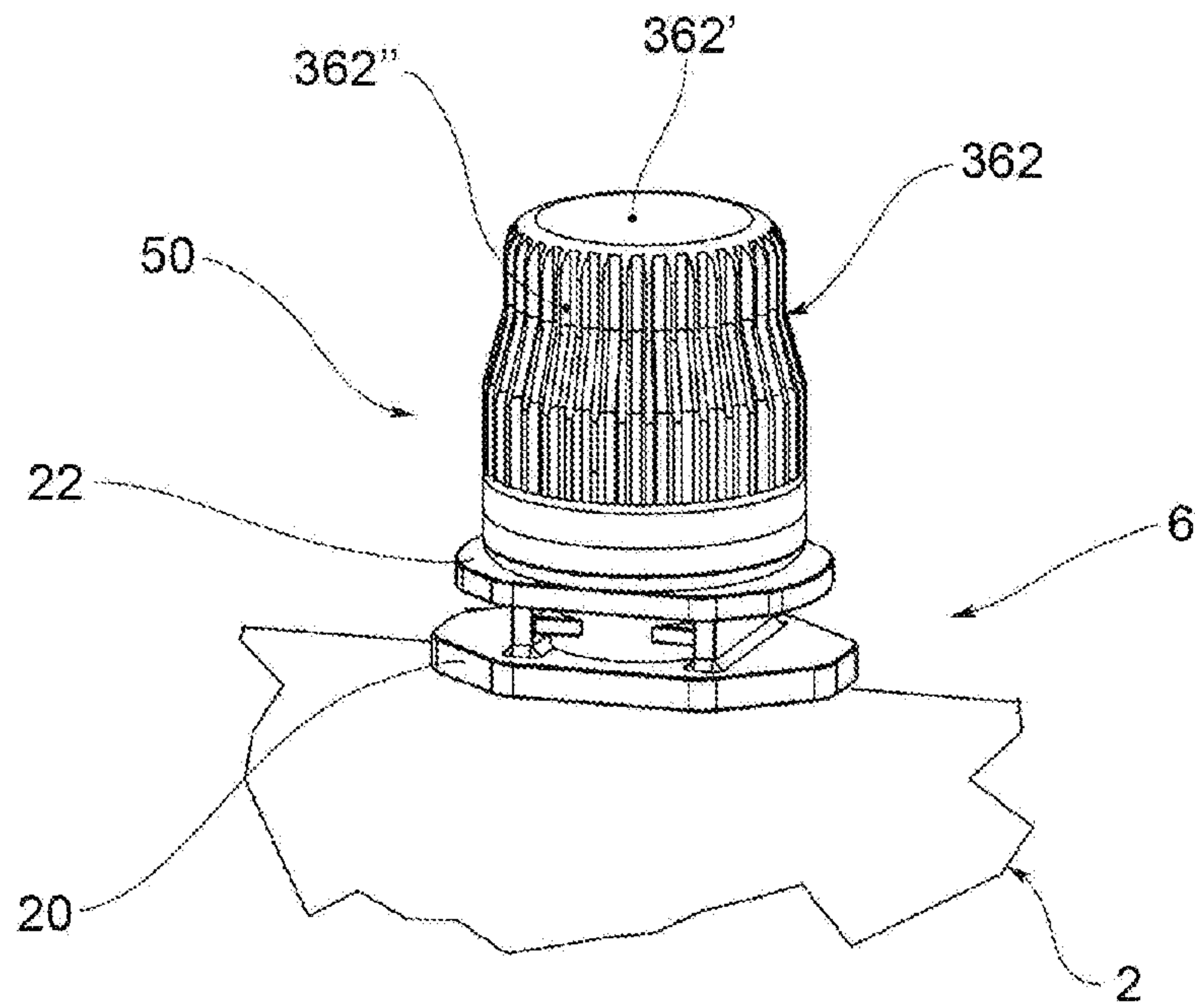


FIG.19

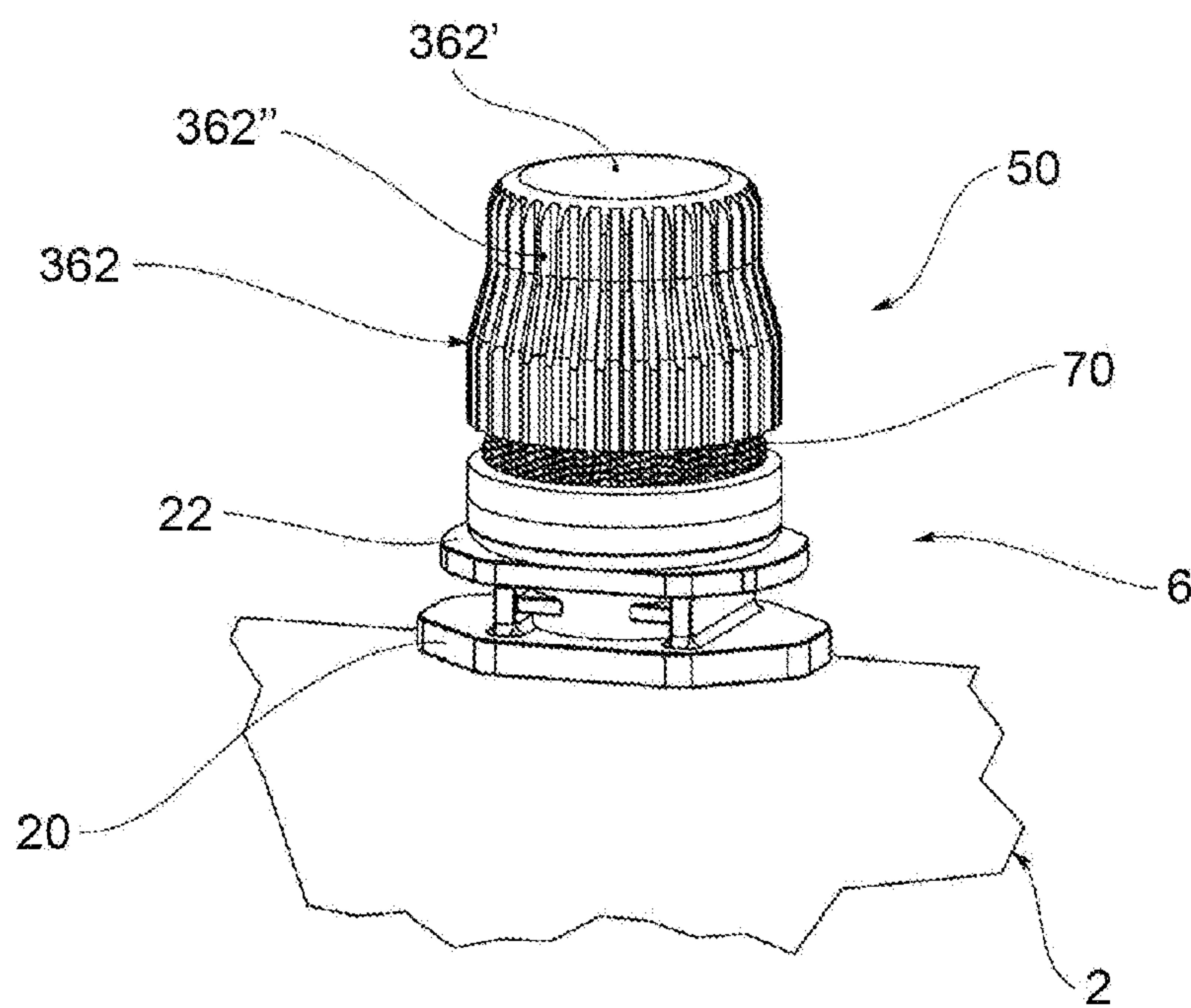


FIG.20

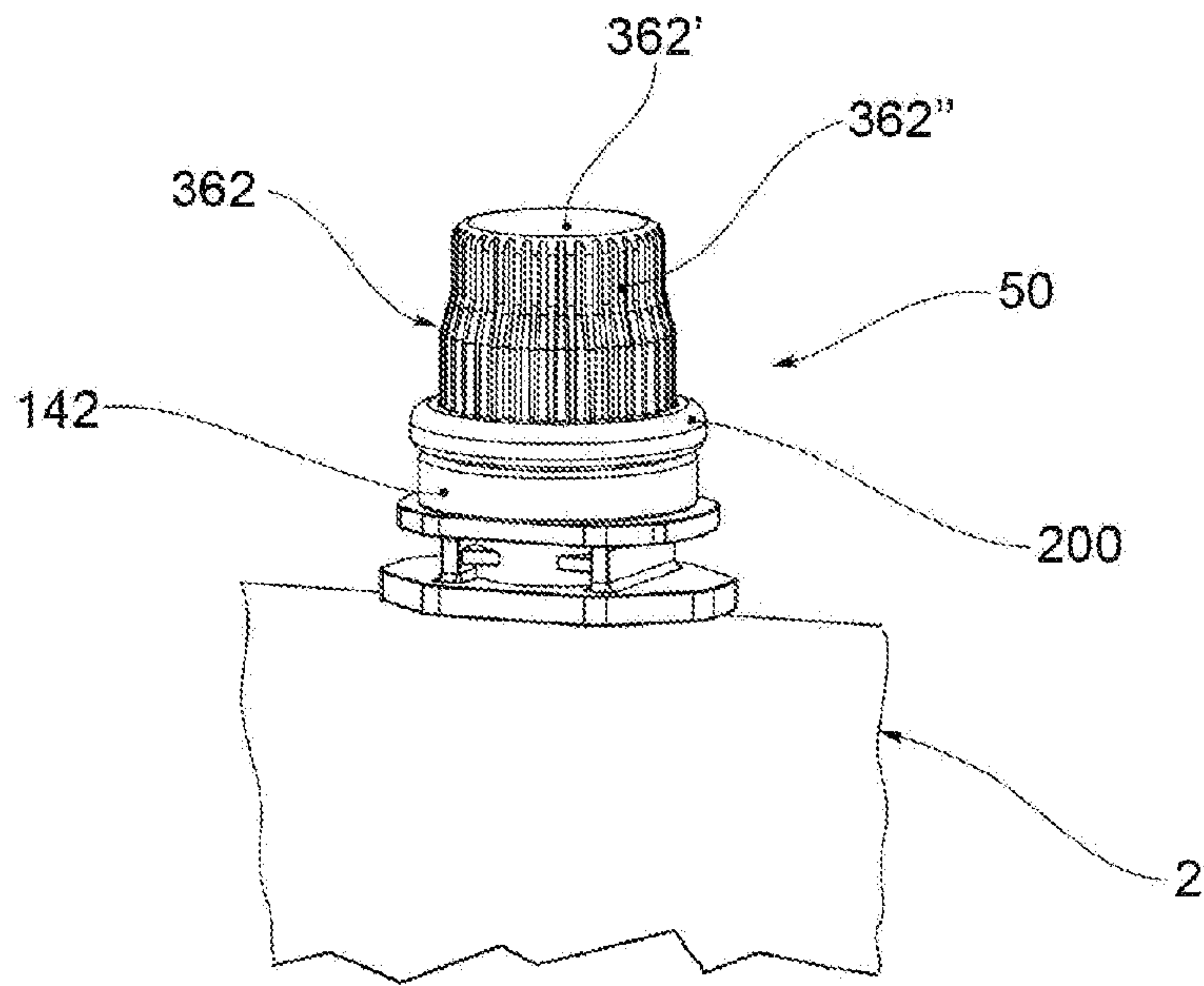


FIG.21

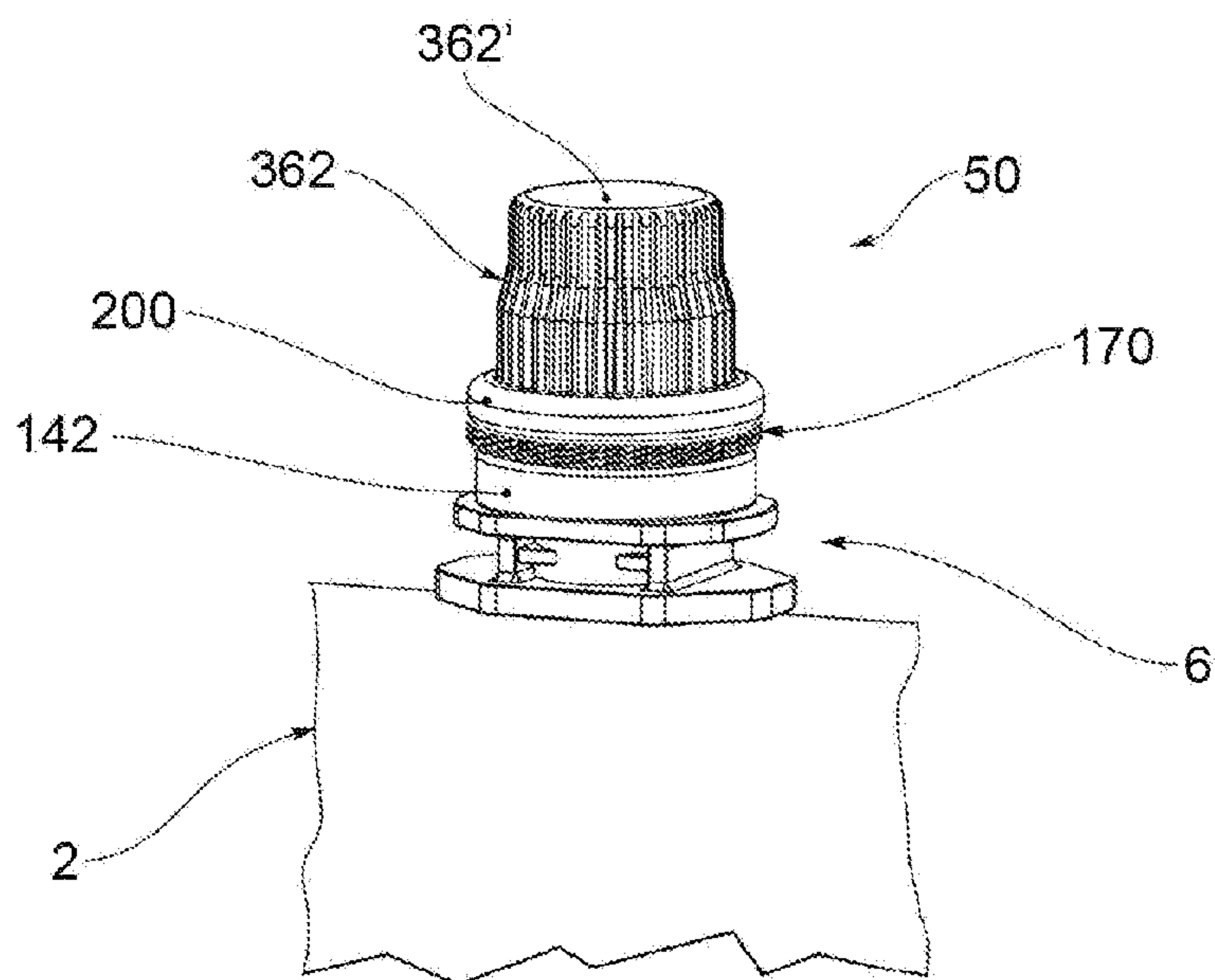


FIG.22